# Dam Fisheries Mitigation



**Bienniel Report 1992-1993**

U.S. Department of Energy
Bonneville Power Administration
Division of Fish & Wildlife

Montana Department of
Fish, Wildlife & Parks

Confederated Salish &
Kootenai Tribes

U.S. Fish and Wildlife Service

June 1994

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# HUNGRY HORSE DAM FISHERIES MITIGATION

## BIENNIAL REPORT 1992-1993

Prepared by:

Hungry Horse Implementation Group

Montana Department of Fish, Wildlife and Parks
Confederated Salish and Kootenai Tribes
U.S. Fish and Wildlife Service

Prepared for:

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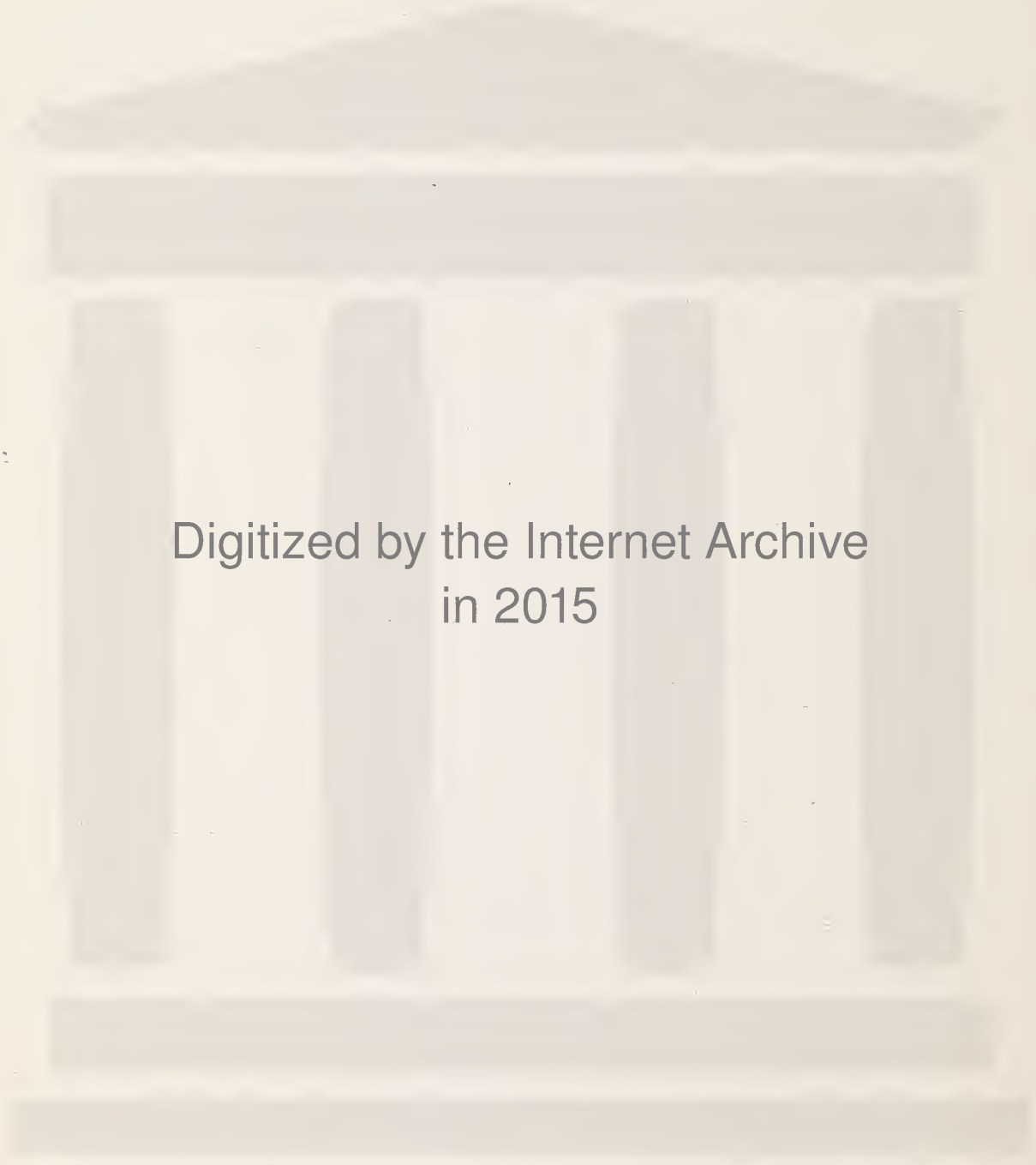

## ACKNOWLEDGMENTS

Funding for this project was provided by the Hungry Horse Mitigation Program under the direction of Bonneville Power Administration. We would particularly like to thank Fred Holm, who guided the project in its formative stages, and Ron Morinaka who has provided oversight for the program in more recent times. The Northwest Power Planning Council members and staff have helped to focus the program on resident fish mitigation efforts. In particular, Stan Grace, John Etchart, Mark Reller, and John Hines have been instrumental.

During the period of this report the Implementation Group (IG) consisted of Joe DosSantos of the Confederated Salish and Kootenai Tribes (CSKT), Jim Vashro of Montana Department of Fish, Wildlife and Parks (MDFWP), and Larry Lockard of the U.S. Fish and Wildlife Service (USFWS). This report was prepared under their direction and with the assistance of staff members Mark Deleray, Delano Hanzel, and Brian Marotz (MDFWP); Wade Fredenberg and Bob Thompson (USFWS); and Les Evarts and Barry Hansen (CSKT).

Additional staff who contributed to various facets of this project, by agency and in alphabetical order include:

| **Confederated S&K Tribes** | **Montana Dept. FWP** | **U.S. Fish and Wildlife** |
|---|---|---|
| Jerry Bisson | Jon Cavigli | Dave Bermel |
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| Jerry Keniston | Tim Taylor | Gar Holmes |
| Dane Morigeau | John Wachsmuth | Sharon Hooley |
| Valarie Roberts | Tom Weaver | Jon Lane |

In addition, Linda Jackson and Jose Aguilar (BPA) have been most helpful in providing timely engineering assistance for construction projects at Creston National Fish Hatchery.

Other land managers and interested groups, including the Flathead National Forest, State of Colorado, National Fish and Wildlife Foundation, Trout Unlimited, Canyon Sportsmen, Girl Scouts, Sportsman and Ski Haus, American Timber Company, F.H. Stoltze Land and Lumber Company, Montana Power Company, Columbia Falls Aluminum Company, and Burlington Northern have also contributed time, effort, and matching funds to create the successes the project has achieved to date. Countless individuals donated personal time and effort to the various projects and we would like to acknowledge their contributions as well.

## EXECUTIVE SUMMARY OF 1992-1993 ACCOMPLISHMENTS

In February of 1990, over forty agency representatives and interested citizens began development of the 1991 Mitigation Plan. This effort culminated in the 1993 Implementation Plan for mitigation of fish losses attributable to the construction and operation of Hungry Horse Dam. The primary purpose of this biennial report is to inform the public of the status of ongoing mitigation activities resulting from those planning efforts.

In 1992 and 1993, the Hungry Horse Mitigation Implementation Group, consisting of a representative from each of the three cooperating agencies (Jim Vashro - MDFWP, Joe DosSantos - CSKT, Larry Lockard - USFWS), identified a number of mitigation opportunities and initiated action on nearly two dozen projects. A habitat improvement project is underway to benefit bull trout in Big Creek in the North Fork drainage of the Flathead River and work is planned in Hay Creek, another North Fork tributary. Bull trout redd counts have been expanded and experimental programs involving genetic evaluation, outmigrant monitoring, and hatchery studies have been initiated. Cutthroat mitigation efforts have focused on habitat improvements in Elliott Creek and Taylor's Outflow and improvements have been followed by imprint plants of hatchery fish and/or eyed eggs in those streams. Stocking also occurred in a section of Mill Creek, where habitat restoration work was carried out under an earlier project. Rogers Lake, west of Kalispell, and Lion Lake, near Hungry Horse, were chemically rehabilitated to remove undesirable populations of illegally introduced fish. They were later restocked with native westslope cutthroat trout. Fish population monitoring in Flathead Lake is ongoing. The five-year kokanee test stocking program in Flathead Lake is underway and a Flathead Lake and River creel census was conducted in 1992 and 1993 to identify baseline fishery parameters. Numerous structural improvements have been implemented at Creston National Fish Hatchery (CNFH) to facilitate production of fish for the mitigation program. Cool and warm water fish habitat has been improved in Halfmoon Lake and Echo Lake.

Public education and public interest is important to the future success of mitigation activities. As part of the mitigation team's public awareness responsibility we have worked with numerous volunteer groups, public agencies, and private landowners to stimulate interest and awareness of mitigation activities and the aquatic ecosystem. The purpose of this biennial report is to foster public awareness of, and support for, mitigation activities as we move forward in implementing the Hungry Horse Dam Fisheries Mitigation Implementation Plan.

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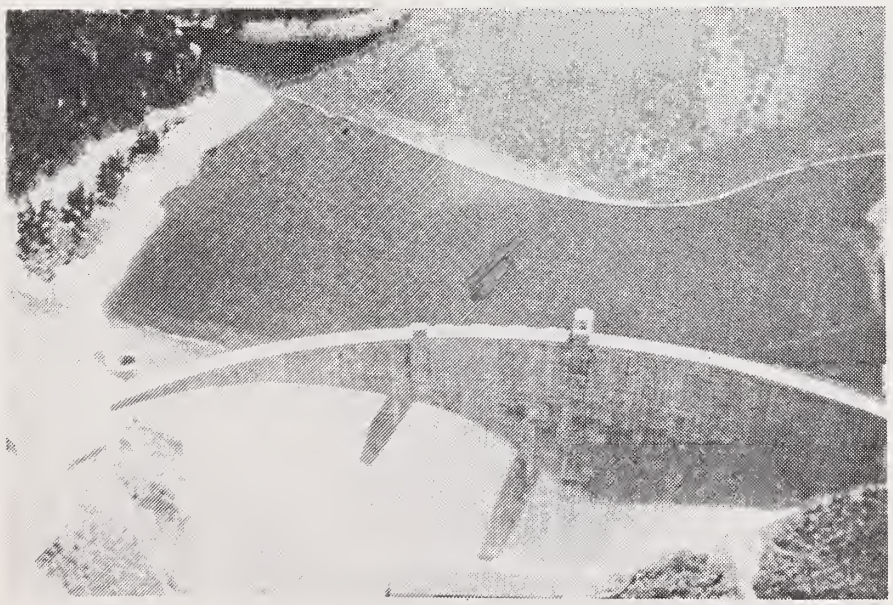
## INTRODUCTION TO THE MITIGATION PROGRAM

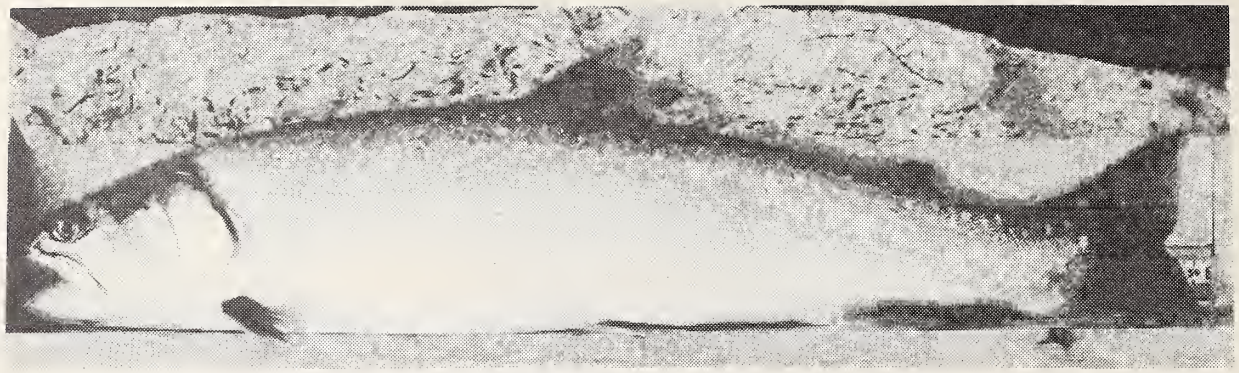
The construction and operation of Hungry Horse Dam has caused extensive impacts on fish populations, aquatic invertebrates, and aquatic habitat in the Flathead River ecosystem for the past forty years. On September 13, 1991, the Northwest Power Planning Council (NPPC) amended the 1987 Fish and Wildlife Program. Those amendments adopted the loss statement presented in the March 1991 Mitigation Plan and directed the Montana Department of Fish, Wildlife and Parks (MDFWP) and the Confederated Salish and Kootenai Tribes (CSKT) to develop an implementation plan to mitigate for losses. Accepted losses and replacement goals included 250,000 juvenile bull trout, 65,000 juvenile cutthroat trout, and 100,000 adult kokanee annually in the Flathead Lake and River system. A fundamental approach to achieving the replacement goals is restoration of habitat to allow natural populations to rebuild.

On March 10, 1993, NPPC formally adopted the Hungry Horse Dam Fisheries Mitigation Implementation Plan, a document which outlined nonoperational measures to replace losses. Nonoperational measures include four broad categories; fisheries habitat enhancement and stabilization, fish passage improvements, hatchery production and fish planting, and off site mitigation. Off site mitigation includes the use of habitat improvement, fish passage, and hatchery measures conducted in areas outside the interconnected Flathead Lake and River system. Operational measures designed to increase levels of fish production in their own right, as well as support attainment of mitigation goals, were not included in the implementation plan and are not discussed in this report. Operational measures include activities such as changes in Hungry Horse Dam (selective withdrawal) and alteration of downstream flow regimes and reservoir pool levels. With adoption of the implementation plan, NPPC asked Bonneville Power Administration (BPA) to continue funding the mitigation program.

The habitat portions of the work have been performed by crews under the direction of the MDFWP. Hatchery work is being performed by the U.S. Fish and Wildlife Service (USFWS) at the Creston National Fish Hatchery (CNFH). Those agencies, in conjunction with CSKT, are cooperatively conducting the monitoring activities.

Hungry Horse Dam





## BULL TROUT

As the largest native fish in the Flathead Lake ecosystem, bull trout have always been a high profile species. In the 1950's, concern for this species became serious enough for MDFWP to begin closing bull trout spawning streams to angling in the North Fork of the Flathead, and the species was recommended by the Montana Chapter of the American Fisheries Society and MDFWP for inclusion on the watch list of "Fishes of Special Concern" in 1986. On October 30, 1992, a group of western Montana conservation groups formally petitioned the USFWS to list bull trout under the Endangered Species Act of 1973. On May 17, 1993, the Service published a "positive 90-day finding", indicating that the petition presented substantial information that listing may be warranted and initiated a formal status review. That review is in progress.

The mitigation goal is to replace lost annual production of 250,000 juvenile bull trout from Flathead Lake tributaries. To accomplish this goal, the Implementation Group (IG) has undertaken a multi-dimensional approach which can be broken into three broad categories; habitat, monitoring, and hatcheries.

### Habitat Enhancement

A major objective of the mitigation plan is to enhance reproduction, survival and growth of bull trout in the contiguous Flathead River system by improving habitat required for spawning, rearing and food production. Activities include reducing sediment levels and improving fish habitat, fish passage, and stream bank stability in Flathead River tributaries and reestablishing native fish species assemblages (bull trout and westslope cutthroat trout) in habitat where those species are well suited.

One of the first habitat projects undertaken was the repair of a road slump on Big Creek, a large tributary to the North Fork of the Flathead River. Big Creek is an important spawning and rearing stream for bull and westslope cutthroat trout. Over the past 15 years, an average of 18 bull trout redds per year were counted in Big Creek, up to one-fourth of the total for four major North Fork spawning streams. Human development of the Big Creek drainage has negatively impacted fish habitat by increasing instream sediment levels and reducing bank stability. Increased sediment levels reduce spawning success, juvenile fish numbers and the quality of habitat available to juvenile fish.

The IG, Flathead National Forest (USFS), MDFWP, American Timber Company and F.H. Stoltze Land and Lumber Company have begun a cooperative project to reduce fine sediment levels in Big Creek. These levels are above natural conditions due to ski area construction, four decades of logging, and miles of road construction. Watershed restoration work began in the summer of 1993. At one site, heavy equipment was used to remove roughly 65 yards of loose material that had slid into the creek, diverting the stream, contributing fine sediment, and causing bank erosion. Erosion control mats were placed, along with grass seed, on disturbed soil to reduce surface erosion. At another location, workers placed logs in small channels to control down-cutting, store sediment, and dissipate peak flows. With continued support and cooperation from the funding sources identified above, watershed restoration will continue in upcoming years.

**Fish Passage**

On Hay Creek, another North Fork tributary, the IG and the Bureau of Reclamation (BOR) are proposing a project to increase surface flows on lower Hay Creek and improve passage for spawning bull trout migrating from Flathead Lake and River. This project can make approximately 17.5 miles of the upper reaches of Hay Creek accessible to migrating Flathead Lake fish. Although bull trout have not been present in large numbers in Hay Creek in the recent past, it has potential to become a major spawning and rearing tributary for bull trout. Gravel deposition, in part a natural process on the alluvial fan at the mouth of Hay Creek, has been exacerbated by logging and other development in the watershed. In addition, channel braiding, beaver dams, and subsurface flows all contribute to create barriers to fish migration, blocking summer fish movements into upstream habitat. The channel instability is also increasing bank erosion, contributing sediment.

The proposed project on Hay Creek is in its early stages and we are investigating opportunities for future stream channel reconstruction. Hydraulic monitoring, soil composition testing, and preliminary planning and engineering are underway.

**Off Site Mitigation**

In 1992 and 1993, habitat and species composition surveys were conducted on tributaries to Swift Creek, the major tributary to Whitefish Lake. Although connected to the Flathead Lake system, bull trout would not be expected to establish migratory patterns from Swift Creek to Flathead Lake. Consequently, this project is considered "off site". Several redds were located each year, but a dewatered section of the East Fork of Swift Creek above Upper Whitefish Lake appears to limit migration during certain years. Opportunities will be explored to create a continuous flow through that reach, which could provide two miles of spawning and rearing habitat for bull trout.

## Monitoring

The purpose of monitoring effort is twofold. First, it allows us to evaluate success or failure of completed and ongoing projects, so adjustments can be made in planning future projects to optimize their potential. Restoration of degraded habitat for a species such as bull trout is largely an untested process. Secondly, through monitoring activities we will be able to measure progress toward achievement of restoration goals. Without such measurements it is difficult to sustain a long-term effort to restore fish habitat in the Flathead Lake ecosystem.

A large portion of our monitoring effort consists of bull trout redd count surveys. A basin-wide survey was conducted in 1992 on nearly all North and Middle Fork spawning streams. In 1993, surveys were conducted on the eight annual monitoring reaches of tributaries to the North and Middle Forks. The 1992 and 1993 redd counts for the North and Middle Fork monitoring streams were the lowest in the 15-year period of record, indicating a significant reduction in adult bull trout numbers in Flathead Lake. The eight long-term monitoring streams contained only 123 redds in 1992 and 122 redds in 1993, compared to an average of 414 redds during 1982-1991. Redd counts are the best index available on the trend in Flathead Lake bull trout numbers and will be continued on the eight North and Middle Fork monitoring streams to evaluate success in restoring bull trout populations.

Due to extreme drawdown demands on Hungry Horse Reservoir, mitigation crews were directed by BPA to evaluate the status of bull trout spawning in the South Fork of the Flathead River drainage upstream from Hungry Horse Dam during the fall of 1993. A total of 366 redds were counted in a basinwide survey. Over 80 percent (302 redds) were found in Wilderness tributaries upstream of the reservoir, the majority being in Little Salmon, Big Salmon, White River, Gordon and Youngs Creeks. Outside Wilderness boundaries, Wounded Buck, Wheeler, and Sullivan Creeks and the Spotted Bear River contained most of the 64 remaining redds. Future redd counts, monitoring Hungry Horse Reservoir bull trout numbers, will be conducted annually in core spawning streams as part of an effort funded by BPA, but not under the direction of the IG. The IG will rely upon the South Fork redd count data as a barometer, comparing future redd counts in the North and Middle Forks of the Flathead as a measure of success of mitigation activities on the interconnected Flathead Lake and River system.

During 1992 and 1993, a genetic sampling project was initiated on bull trout in the Flathead Basin to learn more about the present genetic variation within the species. This information is crucial in order to develop a biologically sound program for fish culture activities and imprint planting in restored habitats. Using backpack electrofishing units, crews collected 1,045 juvenile bull trout from 24 streams in the North, Middle and South Forks of the Flathead, as well as the Swan and Stillwater River drainages in the Flathead Basin. All samples were forwarded to the University of Montana's Wild Trout and Salmon Genetics Lab for analysis and interpretation. In addition, health samples were taken from 207 fish from eight different streams and processed through the USFWS Fort Morgan Fish Health Center. No specific pathogens were detected, indicating the general good health of wild bull trout populations.

To determine river residence time of emigrating juvenile bull trout, nine juvenile bull trout were tagged with small radio tags in Big Creek and their movements monitored through the summer. Four of the nine fish left the rearing area, but were not successfully relocated downstream in the Flathead River. The methodology will be refined in 1994.

Spring gillnetting was completed in 1993 on Flathead Lake to monitor species composition and abundance trends. Paired floating and sinking net sets at sites throughout the lake captured twelve species of fish. Gamefish species comprised approximately half of the total catch, including 36 percent lake whitefish, 8 percent lake trout, 3 percent westslope cutthroat trout, and 1 percent bull trout. Many of the lake trout had fish remains in their stomachs, but individual samples have not been quantified yet.

In the fall of 1992 and 1993, Flathead Lake was gillnetted with sinking nets to verify species composition for the hydroacoustic survey and fish population estimates conducted by MDFWP. These activities are not funded by the IG, but mitigation team members have participated in the past in order to broaden the monitoring database available for assessing the success of the mitigation effort.

The 1992 fall gillnet samples included 65 percent lake whitefish, 29 percent lake trout, and less than 1 percent bull trout. In 1992, stomach samples were collected from 83 lake trout and twenty percent had evidence of fish in their diet; 42 percent were empty. Trout (species uncertain) made up roughly 33 percent of the identified fish in lake trout stomachs. Of ten additional lake trout stomachs collected from the Flathead River, nine contained fish and ten percent of identified fish were trout. These results are of interest to the IG because of the threat that lake trout predation currently poses to our efforts to restore bull trout, cutthroat trout, and kokanee populations in the lake.

In 1993, lakewide verification netting surveys captured over 1,000 fish of which 44 percent were lake whitefish, 33 percent were lake trout, 1 percent were bull trout, and the remainder were nongame species. Catches were similar on both the north and south ends of the lake.

**Hatchery Activities**

A scoping document, developed in 1992, identified CNFH as the best of three potential sites for an experimental bull trout hatchery. Funding was obtained from Montana Power Company to complete the design and retrofit a small-scale experimental bull trout facility in an existing storage building at CNFH. Construction was completed in mid-September 1993 and 20,800 bull trout eggs were immediately collected from seven wild-spawning pairs of fish in the Swan drainage. The eggs were incubated at the isolation facility and experiments have been initiated in cooperation with the Upper Columbia United Tribal Fisheries Research Center at Eastern Washington University to assess the relationship between imprinting and levels of thyroid stimulating hormone. This information is needed in implementing any future stocking programs. Other experiments involving temperature and quality of artificial rearing environment are being planned in conjunction with the USFWS Bozeman Fish Technology Center.

## WESTSLOPE CUTTHROAT TROUT

Westslope cutthroat trout are also an important native species in the Flathead River drainage. Populations of westslope cutthroat trout, throughout their native range in western Montana and northern Idaho, have been severely compromised by habitat degradation, competition with nonnative species, and hybridization with rainbow trout. The mitigation goal is to replace the lost annual production of 65,000 juvenile cutthroat trout in the contiguous Flathead system.

### Habitat Enhancement

Along the Flathead River, in the valley downstream from the confluence of the three forks, there are numerous spring creeks located mostly on private land which have historically provided spawning and rearing habitat for westslope cutthroat trout. Habitat restoration work to restore self-sustaining cutthroat trout populations which will migrate to Flathead Lake is progressing in three of these streams, Mill Creek, Elliott Creek, and the spring creek forming Taylor's Outflow. Our crews have made numerous private landowner contacts, in an effort to stimulate interest and awareness of available stream habitat improvement techniques and streamside management practices beneficial to fish.

Mill Creek, a large (45 cubic feet per second) spring creek, originates at Jessup Mill Pond, the site of CNFH, and flows four miles to the Flathead River about six miles upstream from Flathead Lake. In 1987, to offset impacts to cutthroat trout caused by the Intertie Development and Use (IDU) project at Hungry Horse Reservoir, MDFWP began a BPA funded mitigation project. A goal of that project was to establish a westslope cutthroat population and to restore fish habitat in Mill Creek. The IDU project habitat enhancement measures were completed in 1993, and resulted in 3,000 feet of improved rearing habitat on Mill Creek. The IG will continue monitoring and in recognition of the principles of adaptive management the direction of this project is being reevaluated.

In 1992 and 1993, visual and snorkel surveys along the length of Mill Creek observed westslope cutthroat, rainbow trout, lake trout, bull trout and brook trout in low numbers; nearly all of which were located directly below CNFH, the reach of Mill Creek where the IDU project had previously installed habitat improvement structures. Despite annual plants of up to 20,000 cutthroat (4-to-6 inch length) since 1988, there has been very little positive response in fish

populations. Heavy avian predation and outmigration of the stocked fingerlings appear to be major reasons for the failure to establish a resident or migratory cutthroat trout population. Current fish stocking strategies are being reevaluated.

In an attempt to create new spawning habitat for Flathead Lake cutthroat trout, a 110-foot-long gravel spawning channel was constructed on Elliott Creek, a small spring-fed tributary entering the Flathead River 5 miles upstream from Flathead Lake. Twenty-seven cubic yards of cobble and gravel were transported by cable logging apparatus and placed by hand in the stream channel with shovels. In the spring of 1992 and 1993, we planted 10,000 eyed cutthroat eggs in the channel. The gravels remain in good condition and eggs successfully hatched each year. If the project is successful, spawners will be expected to return beginning about 1997. We are currently exploring ways to reduce expanding brook trout populations in the stream, which pose a competition and predation threat to the cutthroat.

Taylor's Outflow, a spring creek, enters the Flathead River near Columbia Falls, roughly 35 stream miles upstream from Flathead Lake. In order to remove brook and rainbow trout, the 1.5 miles of spring creek and ponds at Taylor's Outflow were treated with rotenone in the summer of 1993. That fall, Taylor's Outflow was stocked with 2,000 westslope cutthroat fry and 600 fingerlings. In order to protect riparian habitat, a fencing project was completed on the upper one mile of stream where the banks had been heavily grazed by livestock. Willows and trees will be planted in the spring of 1994. Pre-engineering surveys were conducted to develop a fish passage structure at the mouth of Taylor's Outflow, to allow spawning cutthroat from the Flathead River to migrate into the channel. Returning spawners are expected beginning in 1996 or 1997.

**Fish Passage**

A major objective of the mitigation program is to improve the passage of migratory fish species according to criteria specified in the Implementation Plan. The filling of Hungry Horse Reservoir in the early 1950's inundated existing roads and necessitated the construction of USFS Road #38 around the reservoir, which created several fish barriers. Since 1988, the IDU project has been working to improve fish passage and has stocked cutthroat trout above the passage barriers. In 1993, led by efforts of the IG and its habitat enhancement team, the MDFWP, BOR, and USFS drafted a Memorandum of Understanding to work cooperatively toward resolution of fish passage problems at Hungry Horse. Projects will be cooperatively funded by all three agencies, with MDFWP contributions made available through mitigation efforts. The IG will continue monitoring efforts to document barriers, the effects on densities of juvenile fish, and the success of culvert modifications in passing fish.

**Off Site Mitigation**

Another major objective of the mitigation program is to create or enhance fisheries in off site areas (lakes and streams not directly connected to the Flathead River system) through chemical rehabilitation and hatchery planting, habitat improvements, or fish passage improvements. These

projects can immediately provide benefits to local fisheries, potentially reduce fishing pressure on mitigation targeted fisheries, and have great public interest. Many lakes in the Flathead Basin have suffered illegal fish plants which, in some cases, eliminated successful and productive fisheries.

In 1992, Lion Lake near Hungry Horse Reservoir was surveyed. It contained only small northern pike, yellow perch, pumpkinseed, and brook trout; all non-native species established by illegal introductions. Stocking of rainbow and cutthroat trout in this 35-acre lake, in the 1960's and 1970's, had provided a popular and successful fishery. The goal of this project was to eradicate the existing fish population and return the lake to a trout fishery. The IG's mitigation team, in cooperation with the USFS, treated Lion Lake in late 1992 with 245 gallons of rotenone solution and restocked the lake in 1993 with about 4,000 westslope cutthroat trout fingerlings.

Rotenone application at Lion Lake

In November of 1993, the IG, in cooperation with the USFS and the National Fish and Wildlife Foundation, chemically rehabilitated 237-acre Rogers Lake west of Kalispell with 495 gallons of rotenone to eliminate populations of yellow perch, brook trout, and redside shiners. Rogers Lake was a productive and popular arctic grayling fishery and a site for viewing spawning activity until illegal introductions of yellow perch in the mid-1980's decimated the arctic grayling population. Reintroduced arctic grayling and westslope cutthroat trout will once again be managed to provide quality fishing opportunities and a genetically pure reserve of these two species.

The mitigation team participated in gravel placement and construction of a 100-foot spawning channel on Bootjack Creek, a tributary to Bootjack Lake, in 1993. The project was sponsored by the local Trout Unlimited Chapter and the Sportsman and Ski Haus sporting goods store, in an effort to improve the trophy trout fishery in Bootjack Lake.

## Monitoring

Ongoing monitoring of mitigation efforts and evaluation of techniques being employed assures the greatest possible efficiency of mitigation expenditures. In keeping with the principles of adaptive management, monitoring is useful in learning from success and failures and incorporating new information to strengthen our program. This concept recognizes biological uncertainty and the long-term commitment required for natural resource management. This includes monitoring of Flathead Lake fish populations and utilizing all available information to locate opportunities for future mitigation projects.

In 1993, estimates of westslope cutthroat populations were conducted in the North Fork of the Flathead River. The 1993 North Fork estimate was roughly one-third lower than a similar 1990 estimate, but similar to 1985 levels.

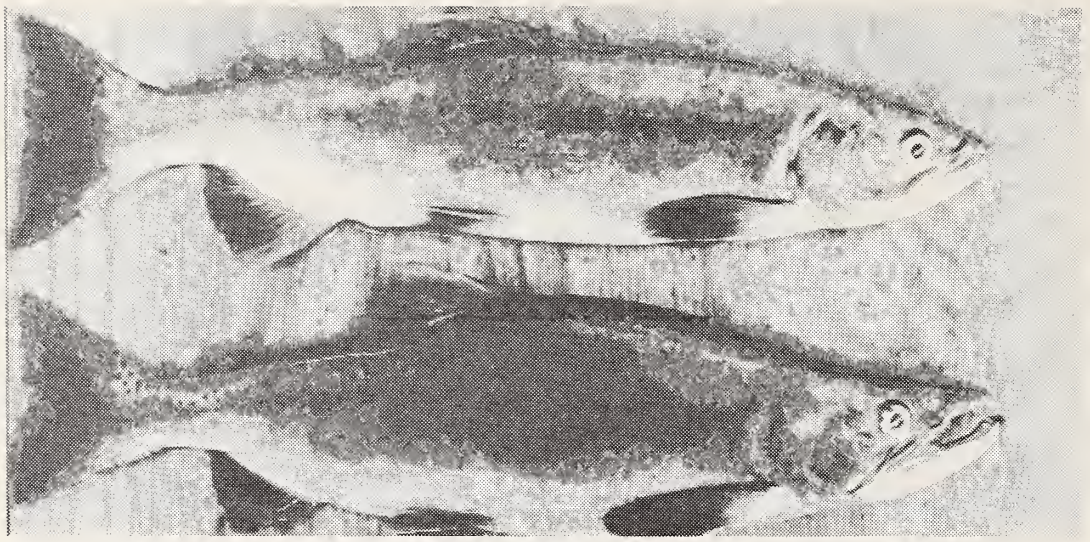
Potential habitat enhancement and fish passage mitigation sites, including small tributaries of the Flathead system, were evaluated during 1992 and 1993. In Stoner Creek, a small tributary entering Flathead Lake, numerous eastern brook trout and ten marked westslope cutthroat trout originating from a Flathead Lake plant at Somers were found during an electrofishing inventory. Because of public opposition to the elimination of the brook trout fishery, planning for rehabilitation of Stoner Creek has been postponed indefinitely.

Abbot Creek, a tributary to the Flathead River near Hungry Horse, was surveyed with backpack electrofishing units. Over 75 percent of the trout captured were eastern brook trout. The remaining 25 percent consisted mostly of rainbow trout with a few cutthroat and possibly cutthroat/rainbow hybrids. This site was identified as a likely prospect for a future cutthroat trout rehabilitation project.

In 1992, an unnamed spring creek tributary to Whitefish Lake was surveyed and westslope cutthroat were collected. All fish had the appearance of hatchery fish and were assumed to originate from hatchery plants into Whitefish Lake. The spring is on private land and may provide opportunity for eyed-egg imprint plants of cutthroat in the future.

## Hatchery Activities

The hatchery program for westslope cutthroat trout has been relatively inactive, as first emphasis has been placed on habitat projects to replace cutthroat losses. Limited numbers of eyed westslope cutthroat eggs have been obtained from the MDFWP Washoe Park Hatchery at Anaconda and reared at CNFH for reintroduction projects such as 1993 plants of Mill Creek, Elliott Creek, and Taylor's Outflow. Similar programs utilizing about 30,000 hatchery cutthroat are scheduled in 1994.



## KOKANEE

Kokanee salmon were introduced into Flathead Lake in 1913 and established a self-sustaining population, providing annual angler harvest of approximately one half million fish per year into the mid-1980's. Since then, the kokanee population declined dramatically, probably from a combination of factors including the establishment of *Mysis* shrimp and subsequent competition, predation, angler harvest, and habitat and spawning losses due to Hungry Horse Dam operations.

### Hatchery Activities

From 1974 through 1983 MDFWP stocked 100,000 to 300,000 kokanee fry annually into Flathead Lake. From 1984 through 1987, during the period of the salmon collapse, MDFWP increased kokanee fry plants in Flathead Lake to 0.6 to 1.2 million fish annually. Kokanee did not reappear in the fishery, so from 1988 through 1991 fry plants of 2.3 to 4.0 million fish per year were initiated by MDFWP. Kokanee did not reestablish in the lake. In 1993, the IG began a five-year stocking experiment with larger-sized fish (6-8 inches).

The supply of kokanee eggs has limited the availability of hatchery-produced kokanee. In 1992, MDFWP biologists began deploying Merwin traps to collect spawning fish, with encouraging results. With partial IG funding the number of traps was increased in 1993 and mitigation crews participated in egg collections from Lake Mary Ronan, Swan Lake, and Bitterroot Lake. Local egg collections were about 1.0 million in 1992 and nearly 2.0 million 1993.

In 1992, about 900,000 kokanee eggs were received at CNFH from Granby Reservoir in Colorado for the mitigation program. Excessive mortality occurred due to nitrogen gas in the water supply. Nearly 388,000 fry were planted in waters throughout the state to bolster future egg supplies and on June 1-2, 1993 about 210,000 kokanee averaging 6.7 inches long were successfully stocked into Blue and Woods Bays in Flathead Lake. An additional 10,000 fish were held back at the hatchery for use as brood fish to produce eggs in 1994.

In 1993, about 2.2 million Colorado eggs were acquired for the mitigation program. The volume of the early rearing tanks at CNFH was inadequate for the large numbers of fish on hand and disease losses due to overcrowding and stress were higher than anticipated. As of the end of 1993, we held approximately 800,000 five inch kokanee from the 1993 year-class for stocking into Flathead Lake in 1994. The 1994 plant will constitute the first year of the planned five-year kokanee test.

In January of 1994, only 100,000 kokanee eggs were acquired from Colorado, due to a shortage in their program. Combined with the IG share of Montana eggs, 700,000 eggs were on hand and hatched in February 1994 to be reared for fingerling stocking in Flathead Lake in 1995.

**Monitoring**

In 1993, hydroacoustic and gillnetting surveys and temperature profiles were completed on Flathead Lake in Blue and Woods Bays to describe baseline conditions before kokanee plants. The June kokanee plant went smoothly, with virtually all of the planted fish in good condition and apparently acclimating well upon stocking.

The 1993 kokanee plant was monitored by gillnetting and from angler reports. For the first four weeks post-stocking, weekly gillnetting targeting lake trout provided stomach samples containing kokanee. In the first week after planting, 83 percent and 53 percent of lake trout contained kokanee in Woods and Blue Bays, respectively. One lake trout had 13 kokanee in its stomach. The average number of kokanee in the stomachs of those lake trout that contained kokanee was three fish. As the month immediately after stocking progressed, kokanee occurrence decreased in stomach samples. Stomachs from 110 lake trout were collected at the annual Mack Attack fishing tournament on Flathead Lake, which occurred three and one-half weeks after fish plants and was restricted to the north half of the lake. At this event, three of 110 stomachs (2.7 percent) contained kokanee. Within one month after stocking, kokanee were no longer found in lake trout stomachs.

It seems apparent the 1993 kokanee plants initially suffered a high level of predation by lake trout. At this time, survival of remaining kokanee is unknown. Some kokanee likely dispersed from the stocking sites, and may have avoided predation and remain in the system. At least two reports of angler-caught kokanee were received in 1993, well after the first month poststocking. In the fall of 1992 and 1993, traditional staging and spawning habitat for kokanee in the Flathead River was searched using jet boats and divers. No adult kokanee or redds were located. The fall 1993 gillnetting surveys on Flathead Lake routinely conducted by MDFWP and CSKT did not capture kokanee, although nets were not set in appropriate areas to target this species. Kokanee were not found in the stomachs of 205 lake trout captured in the fall net sets.

In 1994, MDFWP and CSKT closed Flathead Lake to kokanee fishing for at least two years. Mitigation monitoring efforts will now need to focus on netting, hydroacoustics, and other tools to assess kokanee survival. Emphasis will also be placed on refining stocking techniques to reduce initial predation by lake trout.

## SPECIAL PROJECTS

### Flathead Lake and River Creel Survey

In order to establish a baseline to judge success of mitigation efforts, comprehensive Flathead Lake and River creel surveys were begun on May 17, 1992 and completed May 18, 1993. Data analysis was completed in July 1993 and final reports are currently being completed and printed. Because of the complex nature of the data, separate reports were prepared for the lake and river portions. The methodology and format were standardized as much as possible between studies.

An estimated 47,883 "angler days" were spent fishing Flathead Lake and nearly 43,000 fish were harvested. The harvest consisted of 23,605 (54.9 percent) lake trout, 11,795 (27.4 percent) yellow perch, 7,265 (16.9 percent) lake whitefish, 196 (0.5 percent) bull trout, and 118 (0.3 percent) westslope cutthroat trout. No kokanee catches were reported to creel clerks during the period.

The distribution of the Flathead Lake harvest among species differs from past creel surveys. Prior to 1986, three creel surveys (1962-63, 1981-82, and 1985) documented the importance of kokanee salmon in the Flathead Lake fishery, representing over 90 percent of the harvest. In contrast, the 1992-1993 fishery was primarily for lake trout and there was no measurable harvest of kokanee. Native species (bull and cutthroat trout) account for less than 1 percent of the current harvest.

The annual angler pressure estimate from this study was considerably lower than for previous creel surveys on Flathead Lake. These large differences may be due in part to different survey methodologies, rather than actual angler pressure differences. The MDFWP mail survey of angler pressure, which has used a consistent method of estimating angler use over the years, indicated only a slight decrease in annual pressure since the decline of the kokanee. However, a comparison of summer boat counts between 1985 and 1992 suggests a decline of nearly 50 percent in boat fishermen during the summer months. The comparisons are complicated by differences in seasonal patterns between kokanee and lake trout fisheries.

An estimated 25,362 angler-days were spent fishing the mainstem Flathead River and an estimated 33,694 fish were harvested. The estimated harvest consisted of 22,784 (67.1 percent) lake whitefish, 4,055 (11.9 percent) westslope cutthroat trout, 1,932 (5.7 percent) lake trout, 296 (0.9 percent) rainbow trout, 278 (0.8 percent) mountain whitefish, and 82 (0.2 percent) bull trout. In addition, 12.6 percent of the harvest (4,276 fish) was comprised of miscellaneous species, including brook trout, yellow perch, and largemouth bass.

Anglers kept an average of 0.75 fish/hour on the mainstem Flathead River during 1992-1993 and released half of the fish they caught. Release rates were 95 percent and 87 percent for native bull and cutthroat trout, respectively. Anglers kept nearly two-thirds of the lake trout caught and 87 percent of the lake whitefish they landed.

A comparison of this survey to a previous one conducted in 1981 on the mainstem Flathead River differed markedly. In 1981, an estimated 35,940 angler-days were spent on the river during the open season of mid-May through November and harvest consisted of an estimated 76,830 (86.1 percent) kokanee, 8,557 (9.6 percent) cutthroat trout, 1,827 (2.0 percent) bull trout, 1,582 (1.8 percent) mountain whitefish, and 477 (0.5 percent) rainbow trout. Although the harvest of westslope cutthroat trout in 1992-1993 dropped to about half the number taken in 1981, over two-thirds were released in the most recent survey. In 1981, anglers kept over half of the cutthroat they caught.

Seasonal use patterns on the Flathead River during the summer were similar to 1981 with high use during May through August. The heavy angling pressure during September, nearly 40 percent of the total use in 1981, has dropped due to the decline of the kokanee fishery. But, this loss is partly offset by an increase in pressure during November and December of 1992 because of the increasing lake whitefish fishery.

Angler Creel Survey On Flathead Lake

**Creston National Fish Hatchery Upgrades**

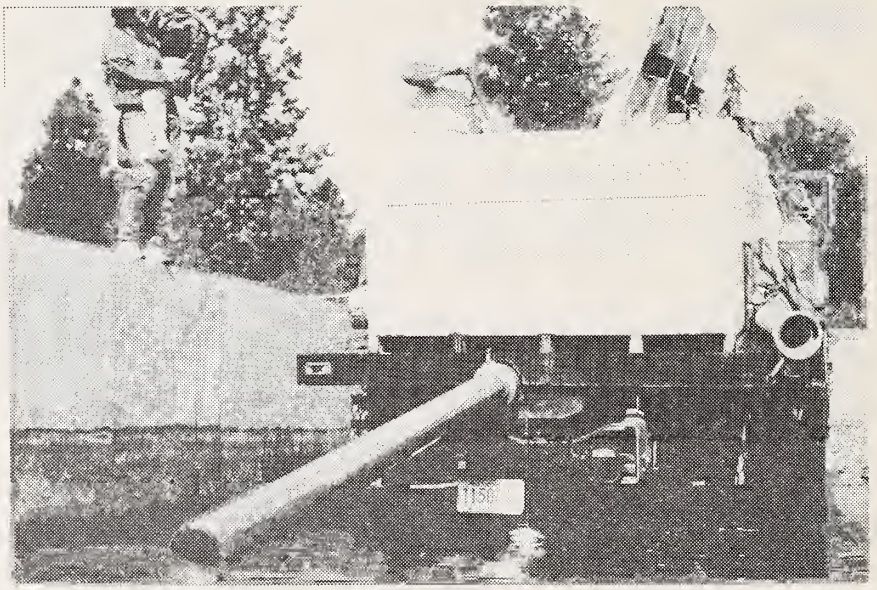
Removal of nitrogen gas from the water supply of 18 lower raceways at CNFH was accomplished in March 1993 with the installation of degassing columns and an oxygen injection system. These actions were in response to abnormally high losses of kokanee salmon fry in 1992, related to the nitrogen supersaturation condition. Excess nitrogen gas in the water supply causes a condition in fish similar to the "bends" experienced by human divers and can result in the outbreak of diseases due to the high level of stress. An experimental plan has been developed in conjunction with BPA and Bozeman Fish Technology Center to evaluate options for degassing the upper 24 raceways.

Concerns regarding effluent from expanded hatchery operations were also evaluated. A scoping group recommended the installation of a settling pond system. Designs have been prepared by BPA to install raceway baffles and a vacuuming and settling system in 1994.

Early rearing tanks provided by MDFWP were installed in 1992 by USFWS, but proved inadequate in size and design for the numbers of kokanee raised. The tank system was upgraded by BPA in early 1994, with much larger rectangular tanks.

Bird netting was installed over the upper 24 raceways to reduce predation losses, which have become excessive in midwinter months, due to mallard ducks and other avian predators.

Kokanee Stocking
At Woods Bay On
Flathead Lake



**Warm and Cool Water Fishery Off Site Enhancement**

With the help of volunteer workers from the Canyon Sportsman group of Coram, fourteen tree and brush piles were constructed and placed in Halfmoon Lake. This off site lake will be managed for warmwater species with the structures designed to increase cover for largemouth bass. Burlington Northern donated 500 tie plates to be used in off site mitigation projects to create fish cover and habitat. In a similar project, crew members placed 20 tree structures in Echo Lake. These will provide cover for juvenile and adult largemouth bass and yellow perch.

**Off Site Public Outreach**

It is not always possible to identify mitigation activities conducted for public education as separate from ongoing and complementary management activities conducted by the agencies. As examples, personnel who are partially funded by mitigation funds organized and supervised a Girl Scout volunteer group which cleaned up a fishing access site on the Flathead River and placed screens around trees to protect them from beavers. We also staffed an aquatic education station at the Family Forestry Expo where fifth graders from across the county were exposed to principles of aquatic ecosystem management. The mitigation program was involved in similar programs conducted at the Jocko Summer Camp and the Somers School Science Fair. We are participating in the organization of a volunteer lake water quality monitoring program and we conducted a fisheries education module at the National Fishing Day Fish Derby. All of these activities are aimed toward increasing public appreciation of the values of ecosystem management and conservation of the fishery resources targeted for mitigation activities.

## FUTURE OF THE MITIGATION PROGRAM

Implementation of the Hungry Horse Dam Mitigation Program involves a long term commitment of protecting and enhancing the interconnected Flathead Lake and River ecosystem. With the continuing and increasing influence of humans on our aquatic ecosystem it will become more and more difficult to protect existing resources, while we attempt to correct damages caused by hydroelectric development on the Flathead River. We are dedicated to implementing this program over the long term and will not sacrifice long term goals for short term gains. Many of the gains from habitat protection and restoration efforts can only be realized over the long term. The experimental nature of habitat projects and fish supplementation programs means that not all project activities will be equally successful. However, we feel that by utilizing a balance of habitat restoration and enhancement efforts and hatchery restoration and supplementation opportunities, we can replace lost recreational fisheries while enhancing populations of native fish and their ecosystems. With the continuation of BPA funding and continued public support of this program, we hope to sustain and improve the condition of the Flathead fishery for future generations.

Flathead Lake at "The Narrows"

## Appendix A - Project Status

Table 1. Chronological progress matrix of major Hungry Horse Mitigation Projects. Presented by species targeted.

P = Planning; I = Implementation; M= Monitoring; C= Completion

| PROJECT NAME | CATEGORY | 1991 | 1992 | 1994 | 1994 | 1995 |
|---|---|---|---|---|---|---|
| **-------- BULL TROUT --------** | | | | | | |
| Big Creek | Habitat | | P | I | I | I |
| Hay Creek | Habitat | | P | P | I | I |
| Swift Creek | Habitat | | M | P | P | I |
| Redd Counts | Monitoring | I | I | I | I | I |
| Genetic Survey | Monitoring | P | I | I | I | M |
| Radio Track | Monitoring | | | P | I | C |
| Experimental Hatchery | Hatchery | | P | I | I | I |
| **---- WESTSLOPE CUTTHROAT TROUT ----** | | | | | | |
| Mill Creek | Habitat | I | I | I | M | M |
| Elliott Creek | Habitat | | I | I | M | C |
| Taylor's Outflow | Habitat | | P | I | I | M |
| HH Res. Barriers | Habitat | P | I | I | I | I |
| Lion Lake | Off Site | P | I | M | C | |
| Rogers Lake | Off Site | | P | I | M | C |
| Population Status | Monitoring | I | I | I | I | I |
| Cutthroat Stocking | Hatchery | I | I | I | I | I |

| PROJECT NAME | CATEGORY | 1991 | 1992 | 1993 | 1994 | 1995 |
|---|---|---|---|---|---|---|
| ---------- KOKANEE ---------- | | | | | | |
| Flathead Lake Stocking | Hatchery | | P | I | I | I |
| Flathead Lake Gillnetting | Monitoring | | P | I | I | I |
| -------- SPECIAL PROJECTS -------- | | | | | | |
| CNFH Upgrades | Hatchery | P | I | I | I | I |
| Cool & Warm Habitat | Off Site | | I | MI | MI | MI |
| Flathead Lake & River Creel | Monitoring | P | I | I | C | |
| Public Outreach | Off Site | I | I | I | I | I |

**Appendix B - Reports**

The following file reports were written in conjunction with various activities of the mitigation program. If you would like a copy of any of them please contact the Fisheries Division of Montana Department of Fish, Wildlife and Parks in Kalispell at (406) 752-5501 or the agency listed for the author.

**Fisheries Mitigation Plan for Losses Attributable to the Construction and Operation of Hungry Horse Dam**; Montana Department of Fish, Wildlife and Parks and Confederated Salish and Kootenai Tribes, Kalispell and Pablo; March 1991; 71 pp.

**Hungry Horse Dam Fisheries Mitigation Implementation Plan**; Montana Department of Fish, Wildlife and Parks and Confederated Salish and Kootenai Tribes, Kalispell and Pablo; March 1993; 43 pp.

**Flathead Lake Angler Survey**; Les Evarts, Barry Hansen, and Joe DosSantos, Confederated Salish and Kootenai Tribes, Pablo; February 1994; 38 pp.

**Flathead River Angler Survey**; Delano Hanzel, Montana Department of Fish, Wildlife and Parks, Kalispell; In Progress.

**Planning Considerations for Development of a Low-Cost Bull Trout Isolation and Rearing Facility**; Wade Fredenberg, U.S. Fish and Wildlife Service, Creston National Fish Hatchery; February 1993; 20 pp.

**Genetic Sampling Plan for Bull Trout in the Flathead River Drainage**; Wade Fredenberg, U.S. Fish and Wildlife Service, Creston National Fish Hatchery; December 1992; 19 pp.

**Collection of Juvenile Bull Trout in the Flathead River Drainage, Montana**; Wade Fredenberg, U.S. Fish and Wildlife Service, Creston National Fish Hatchery; December 1993; 26 pp.

**Gas Supersaturation Monitoring Report, Creston National Fish Hatchery**; Wade Fredenberg and Don Edsall, U.S. Fish and Wildlife Service, CNFH; November 1993; 17 pp.

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